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Testimony before the U.S. Senate Energy and Water Appropriations Subcommittee Hearing on the Future of Electric Vehicles Senate Dirksen Office Building, Room 192 February 23, 2010

Mr. Chairman and Committee Members, thank you for the opportunity to testify today on behalf of General Motors. I am Alan Taub, Vice President of Global Research and Development. I lead GM's worldwide R&D efforts on advanced technology.

I am pleased to be able to speak to you today regarding our plans for the Chevrolet Volt and our other electrically driven vehicles. I also look forward to discussing the infrastructure that will be needed to ensure that recharging and refueling options are available to American consumers.

This is an important time in the history of the automobile industry. The world we live and do business in is changing. Automotive technology is clearly changing and the challenges and opportunities faced by our industry continue to evolve.

For these reasons, GM has placed very high priority on vehicle electrification. We believe electric vehicle technology is one of the best long-term solutions to simultaneously increase energy independence and security, remove the automobile as a source of emissions, and enable more sustainable energy pathways.

The electrification of the vehicle will also allow automakers to create exciting new vehicles that customers will want to drive and own. This is critical. Achieving high-volume sales of advanced technology vehicles is the only way to realize the large-scale energy and environmental benefits we are seeking.

To support our focus on bringing the right products to market, at the right time, for the right cost, GM has an advanced propulsion technology strategy that addresses both energy efficiency and energy diversity.

As part of this strategy, we are working to dramatically improve the efficiency of our conventional engines and transmissions, as we've been doing for decades. We have also been working hard to improve overall vehicle efficiency by reducing vehicle weight and improving aerodynamics and rolling resistance.

At the same time, we have intensified our efforts to displace petroleum-based fuels by building more vehicles that run on alternative fuels. This includes biofuels such as ethanol and biodiesel. In fact, of the 7.5 million E85 flex-fuel vehicles currently on U.S. roads, more than four million are GM cars and trucks. GM, along with Ford and Chrysler, has committed to make half of our vehicle production flex-fuel-capable by 2012, provided there is steady growth in the fueling station infrastructure.

Our commitment to alternatives also includes expanding and accelerating our development of electrically driven vehicles.

Today, I want to highlight our progress on GM's broad-based plans for vehicle electrification, which includes the Chevrolet Volt extended-range electric vehicle, plug-in hybrids, and fuel cell-electric vehicles. GM is working on all of these vehicle solutions because they are all electrically driven, yet each offers unique attributes that align with different driving needs.

Electrification simply means the vehicle is powered by electrons that energize the motor. There are two ways to accomplish this. One is to use a battery that draws electricity when it is plugged into the grid. The other way is to store electrical energy in the form of hydrogen on board the vehicle and convert it into electricity in real time.

Developing a variety of electric vehicles is also the best way to meet the driving needs of our customers. Those needs can involve a short commute to work, longer-range driving, or the requirement to carry more passengers or haul cargo. In other words, we think consumers will love the compact Chevrolet Volt extended-range electric vehicle for city and suburban driving. Meanwhile, our Chevrolet Equinox fuel cell EV – which has logged more than 1.2 million miles of driving through our Project Driveway market test – would appeal to drivers who need a larger vehicle.

Since electrically driven vehicles use many common components and subsystems, technology developments can be applied across the range of EV options.

GM believes there are many benefits available with electrically driven vehicles. They have the potential to:

- Reduce petroleum consumption.
- Create the pathway to new energy sources.
- Reduce CO₂, especially as utilities add renewable energy sources to their portfolio.
- Create new technology jobs in areas such as cell chemistry, batteries, motors, power electronics and controls, and vehicle systems. Today, the Volt supply base already includes 196 suppliers in 24 states. And that's just beginning to scratch the surface of the potential for advanced vehicles to be a real driver for economic and jobs growth.

Beyond these societal benefits, the electrification of the vehicle also enables auto manufacturers to design a better vehicle. The instant torque at the wheels available with electric drive makes the vehicle more fun to drive. Electrification frees vehicle designers and engineers to develop exciting new architectures. It also enables faster, more capable, more responsive vehicle subsystems, features, and accessories.

The Volt combines the best aspects of battery electric propulsion with the technology on today's vehicles to deliver a superior consumer experience. It will deliver up to 40 miles of electric-only, gas-free, emissions-free driving. And when the battery is depleted, its extended-range capability provides up to an additional 300 miles of range, supplying electricity to the drive unit while also sustaining the charge of the battery.

GM is targeting the launch of the Volt in November. We have announced our initial markets, which include the greater Los Angeles area, Detroit, and Washington, D.C., and we will be expanding beyond these three markets. We are working on a managed start and we will build thousands the first year and tens of thousands after that.

GM is working with the Electric Power Research Institute, electric utilities, and other interested parties on launch market plans that include home, work, and public charging. We are grateful to the Department of Energy for the grant provided under the American Recovery and Reinvestment Act (ARRA) that will allow us and our utility partners to demonstrate how the Volt interacts with the electric grid. Our research shows that consumers refuel close to home and work. For this reason, we believe efforts to support initial infrastructure investment should focus on home and work location opportunities, then public charging.

You have asked us to address the issue of how to get electric vehicles to high volume. In addition to creating the refueling infrastructure for electric vehicles, this will require vehicle solutions that are robust and affordable for consumers. This is a question not only of technological maturity, but of getting through the 2-3 cycles of learning needed to reach high-volume production.

With respect to the technology, we still need to achieve cost breakthroughs, faster recharge, and good low-temperature performance with lithium-ion batteries. We also need to address technical challenges related to electric motors and power electronics. Along with batteries, these are the other key components of electric vehicle systems. In both these areas, we need to realize materials, cost, design, and efficiency breakthroughs.

DOE has been supporting vital research on batteries, motors, and other electric vehicle technologies through the FreedomCAR and Fuel Partnership. The department is also helping build U.S. manufacturing capability through ARRA funding. GM is grateful for the grants we received to help us open our new battery manufacturing plant in Brownstown Township, Michigan and our electric drive production center in White Marsh, Maryland. These two facilities are among the first advanced battery and electric motor manufacturing plants in the United States to be operated by a major auto company. They will enable us to gain valuable learnings as we move down the cost curve on these technologies.

Reducing cost is crucial because today's first-generation technology remains out of reach for many buyers. In our industry, driving to the right value equation for consumers generally takes three cycles of learning before a technology can become cost-competitive. For the automotive industry, this period from first commercialization to the third cycle of learning is a critical time when a new technology can either take off, become a niche play, or even fade away entirely. If we cannot get beyond this period, a new technology will never get to large volumes – and will not significantly impact our national petroleum consumption or greenhouse gas emissions.

Transitioning to the point where the technology can be used in enough cars to achieve the necessary economies of scale to make it affordable is a large challenge. Historically, government technology development programs have ended before this point. In many of these programs, the goal is to meet a series of technical milestones. These may get you to first-generation technology, but if our metric is how much a technology decreases petroleum consumption or greenhouse gases, we really need to move the focus to that third generation of the technology, when high-volume manufacture and sales are possible. This will require more than just consumer tax credits for new technologies. It really means deeper re-thinking of our efforts to accelerate the deployment of advanced automotive technologies.

The challenge of getting through the first few cycles of learning is compounded by the need to create a new infrastructure. At GM, we are making a very large commitment in dollars and manpower to bring our extended-range electric vehicle technology to market this year. In order to reach our national goals, we need a similar commitment to infrastructure development.

What does all this mean for the Committee? In preparing this year's Energy and Water Appropriations bill, we urge the Committee to consider the following:

• First, focus any funding for EV infrastructure on making home recharging easy for the consumer. This should be followed by workplace charging. Public charging facilities will become more important over time, but if we do not make home

- chargers work for the consumer, we are not going to get EVs to a scale where public charging makes sense.
- Second, increase the level of DOE's efforts on reducing the cost of electric motors and power electronics. To make EVs affordable, we need to reduce these costs, not just the cost of the batteries.
- Third, there are a number of options for repurposing automotive energy storage batteries after their initial use in electric vehicles. Congress has a role in incentivizing the creation of these options. It should consider adopting either the concept of a battery warranty fund or the proposal of the Electrification Coalition to establish a floor on the value of advanced automotive batteries that are repurposed for use in stationary energy storage.
- Fourth, remember that electric vehicles powered by batteries are not the only type of electric vehicles and, in fact, are not the best vehicle solution in some market segments. I urge the Committee to extend the Fuel Cell Test and Validation Program in FY 11 with technology insertion to ensure that we have the latest in fuel cell technology on U.S. roads. Congress should also begin to fund section 782 of the Energy Policy Act of 2005, which will pay for the cost differential for federal and state fleet purchases of fuel cell vehicles. This funding should also be available until expended, so that auto companies can plan on early fuel cell purchases in the 2012-2015 timeframe, when early federal purchase of even a few thousand vehicles will have a huge impact on accelerating the technology.
- Fifth, ensure that the U.S. keeps pace with Germany and Japan on hydrogen infrastructure, but focus these efforts in 2-3 regions of the country where commercialization can start. For example, forty hydrogen stations in the Los Angeles metro area would be a game-changer.
- Finally, reframe multi-agency goals and priorities for advanced technology vehicles, from the point where technology metrics are met to the point where high-volume production is possible basically, at the third cycle of learning.

GM needs support for all advanced technologies, including the Volt. We welcome government and cross-industry partnerships to accelerate both technology development and early commercialization.

Thank you for the opportunity to testify today. I look forward to your questions.